

TRANSFER OF THE SUBGENUS *DAVISMYIA* FROM *WYEOMYIA* TO *SABETHES* AND DESCRIPTION OF THE TYPE SPECIES, *MIAMYIA PETROCCHIAE* (DIPTERA: CULICIDAE)¹

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ABSTRACT. The subgenus *Davismyia* is transferred from the genus *Wyeomyia* to the genus *Sabethes* and the type species, originally named *Miamyia petrocchiae*, is described and illustrated in the adult, larval and pupal stages.

INTRODUCTION

The neotropical genus *Sabethes* Robineau-Desvoidy is a paragon of beauty among the genera of mosquitoes. Though these brightly colored mosquitoes equal the *Morpho* butterflies in beauty, they are not so innocuous. Over the years, several studies have shown that species of this genus are involved with virus maintenance and transmission in the wild. *Sabethes chloropterus* (von Humboldt), for example, has repeatedly been found infected with St. Louis encephalitis virus (Galindo et al. 1959) and it is known to harbor yellow fever and Ilheus viruses in Central America (de Rodaniche et al. 1957, de Rodaniche and Galindo 1957). This species is also known to transmit yellow fever virus to man (Galindo et al. 1956, de Rodaniche et al. 1959).

Studies of disease ecology involving *Sabethes* mosquitoes are extremely limited because the species are poorly known and difficult to identify accurately with existing keys and species descriptions. This problem is further exacerbated by the lack of a sound system of internal classification and because the limits of the genus are poorly defined. The genus has not been revised since Lane and Cerqueira (1942) and Lane (1953), and their concepts and classification of the genus are based entirely upon adult characteristics. These authors distinguished three subgenera within the genus based on the states of only two characters: (1) the presence or absence of upper proepisternal setae, and (2) the presence or absence of white markings on the midtarsus. They defined the subgenus *Sabethes* as that group of species which lacks upper proepisternal setae and placed those species which possess these setae into either *Sabethoides* Theobald or *Sabethinus* Lutz depending on whether or not they have white scaling on the midtarsus. They defined those species with white scaling as members

of the subgenus *Sabethoides*, and those without as members of *Sabethinus*.

The genus *Sabethes*, as we currently interpret it, includes all of those species of the tribe Sabethini in the New World which in the adult stage have broad, overlapping, brilliant metallic colored scales covering the scutum, and in the larval stage have the maxillary palpus and cardo completely fused with the body of the maxilla. The larval maxilla also bears a large terminal rigid clawlike process and a reduced maxillary brush composed of individual flexible filaments. Larvae of the genus *Johnbelkinia* Zavorzink also have the palpus and cardo fused with the maxillary body, but the maxillary brush is represented by a bundle of agglutinated or fused filaments which is much longer than the terminal process. We are unaware at this time of features that reliably distinguish the pupae of *Sabethes* from those of other sabethine genera.

Through a series of coincidental observations made during complementary studies of the genera *Wyeomyia* and *Sabethes* (Harbach and Peyton 1990), we discovered that the type species of the subgenus *Davismyia* of *Wyeomyia* possesses the adult and larval characters which are synapomorphic for *Sabethes*. This species, originally described as *Miamyia petrocchiae* by Shannon and del Ponte (1928), differs from all other species of *Sabethes* in bearing prealar setae. We believe that the presence of these setae and a lack of knowledge of the immature stages led Lane and Cerqueira (1942) to regard *petrocchiae* as a species of *Wyeomyia* rather than one of *Sabethes*. Ironically, these authors noted the presence of metallic colored scutal scales as in *Sabethes* and proposed the subgenus *Davismyia* based on this character. Since *petrocchiae* is the only species of *Sabethes* known to possess prealar setae, we also recognize *Davismyia* as a valid taxon within this genus.

The subgenus *Davismyia* previously included four nominal species. In addition to *petrocchiae*, Lane and Cerqueira (1942) also included *schmusei* Martini and *arborea* Galindo, Carpenter and Trapido. *Wyeomyia ininicola* was described and tentatively placed in this subgenus by Faurean and Pajot (1974). *Wyeomyia schmusei* is virtually

¹The views of the authors do not purport to reflect the views of the Department of the Army or the Department of Defense.

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE DEC 1990		2. REPORT TYPE		3. DATES COVERED 00-00-1990 to 00-00-1990	
4. TITLE AND SUBTITLE Transfer of the Subgenus Davismyia from Wyeomyia to Sabethes and Description of the Type Species, Miamiya Petrocchia (Diptera: Culicidae)				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Walter Reed Army Institute of Research, Department of Entomology, Walter Reed Biosystematics Unit, Washington, DC, 20307				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT see report					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 11	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

unknown and the unique type specimen is lost (Belkin 1971), but based on the original description (Martini 1931a) it seems likely that this nominal species actually represents a species of *Sabethes*. Both *arborea* and *ininicola* appear to represent distinct species of *Wyeomyia* as currently defined. Although we are uncertain of the subgeneric placement of *ininicola*, we know that *Sabethes carrilloi* Sutil O. and Pulido F. is consubgeneric with *arborea*, and these two species, along with *tarsata* Lane and Cerqueira of the subgenus *Dendromyia* Theobald, appear to represent a distinct phyletic line within the genus *Wyeomyia*. At present, we are retaining both *schnusei* and *ininicola* in the genus *Wyeomyia* without subgeneric assignment.

Present knowledge of the genus *Sabethes* is very incomplete. Only slightly more than half of the currently recognized species are known in the adult, larval and pupal stages, and many new species remain to be described. The subgeneric classification of the genus by Lane and Cerqueira (1942) and Lane (1953) is unnatural and cannot be revised without careful consideration of the immature stages. With so little known about the immature stages and the internal classification of the genus, it would be premature to characterize the subgenus *Davismyia* and its type species by way of comparison with currently recognized taxa. It follows that anything said about phylogenetic relationships would be meaningless. Consequently, the subgeneric and species treatments given below are descriptive rather than diagnostic and are presented for heuristic reasons only. *Sabethes petrocchiai* is described in detail in the adult, larval and pupal stages in order to facilitate further study and comparison with other species within the genus. A few salient features of this species are used to characterize the subgenus.

The terminology and abbreviations recommended by Harbach and Knight (1980, 1982) are used in the descriptions and illustrations. Names for specialized structures of the male genitalia and the system of reference for elements of seta 1-S of the larval siphon are taken from other sources (see Harbach and Peyton 1990). Use of the letter abbreviations proposed by Belkin et al. (1970) for the gonostylar lobes in males of *Wyeomyia* is provisional only and is not intended to reflect established homologies between species of *Sabethes* and *Wyeomyia*. The gonostylar lobes are variously developed and provide excellent species specific characters; however, uniform positioning of the gonostyli are necessary for accurate interpretation of structure and correct species determination. We recommend the manner of positioning illustrated in this paper.

TAXONOMIC TREATMENT

Genus *Sabethes* Robineau-Desvoidy

Subgenus *Davismyia* Lane and Cerqueira

Wyeomyia, subgenus *Davismyia* Lane and Cerqueira, 1942:582. Orthotype: *Miamyia petrocchiai* Shannon and del Ponte.

Davismyia currently stands as a monotypic subgenus within the genus *Sabethes*. Its affinities are unknown. Salient features include the presence of prealar setae in adults; the placement of seta 4-C farther lateral in relation to seta 1-C, the highly reduced maxillary brush, and the lateral position of seta 8-T between 7-T and the pleural setal group in the larva; and the long seta 5-III in the pupa. These traits may prove to be diagnostic for the subgenus once the various species of the other subgenera of *Sabethes* are better known.

Sabethes (Davismyia) petrocchiai (Shannon and del Ponte)

petrocchiai Shannon and del Ponte, 1928:94 (*Miamyia*). Type female: Raco, Tucuman, Argentina (non-extant).

monoleua Martini, 1931b:116 (*Miamyia*). Holotype female: San Jose (Formosa), Argentina (SMNS). Synonymy with *petrocchiai* by Lane and Cerqueira 1942:583.

Wyeomyia (Davismyia) petrocchiai of Lane and Cerqueira 1942:536, 582, 583 (Brazil, Paraguay; syn., ♀); Duret 1950:313 (Argentina; list, syn., coll. rec.); Lane 1953:867, 936 (Argentina, Brazil, Paraguay; syn., info. on type, ♀); Lane and Causey 1955:12-14 (Brazil; ♂*, L*, P*); Belkin et al. 1968:11, 19 (Argentina; info. on type, L bionomics note); Peyton et al. 1983: 67, 69 (Bolivia; coll. rec., A bionomics).

Wyeomyia (Dendromyia) petrocchiai of Lane 1939:146 (Argentina, Brazil; list, lit. sum., distr.).

Wyeomyia (Wyeomyia) petrocchiai of Lane 1937:125 (Brazil; coll. rec.); del Ponte and Cerqueira 1938:227-228 (Brazil; A, tax.); Prosen et al. 1963:77 (Bolivia; A, coll. rec.).

Wyeomyia petrocchiai of Lane 1936:9 (Brazil; A bionomics note); Roberts et al. 1984:345 (misspelled as *petrocchiai*) (Bolivia; A bionomics).

Miamyia petrocchiai of Dyar 1928:66 (Brazil; ♀); Shannon 1930:498 (Argentina; list); del Ponte 1939:540 (Brazil; A); Stone and Knight 1957:126 (erroneous info. on type).

Wyeomyia (Wyeomyia) arthrostigma in part of Edwards 1932:84 (syn.).

Miamyia (Miamyia) arthrostigma in part of da Costa Lima

1930:191-194 (Brazil; syn. of *petrocchia* with *arthrostigma* Lutz, 1905: ♂, ♀ keys, A).

Wyeomyia (*Davismyia*) *monoleua* of Belkin et al. 1968:11, 18 (Argentina; info. on type, L bionomics note).

Wyeomyia monoleua of Belkin 1968:41 (info. on type).

Wyeomyia monoleuca [lapsus for *monoleua*] of Mattingly 1955: 28 (info. on type).

Female. *Head:* Eyes slightly separated between frons and vertex. Vertex, occiput and postgena covered with broad decumbent scales, ocular line without scales; scales of vertex and occiput pale golden with brilliant violet and blue iridescence, occiput with transverse row of narrow semierect truncate scales at back of head, scales of postgena silvery. Ocular setae dark, rather inconspicuous and close to margin of compound eye; 2 prominent golden interocular setae project well forward. Clypeus and frons without scales and setae, with dense covering of fine white aculeae (pubescence). Antenna 1.65-2.00 mm (mean 1.84 mm), verticillate as usual but flagellar whorls with long setae as in males; pedicel with covering of fine white aculeae and few inconspicuous fine pale setae on mesal surface; flagellomere 1 with some inconspicuous broad dark scales on dorsomesal margin. Proboscis shorter than forefemur, length 2.03-2.32 mm (mean 2.19 mm), with narrow, inconspicuous streak of pale scales at midlength on ventral surface; labellar basal setae long, pale. Maxillary palpus short, length 0.33-0.48 mm (mean 0.40 mm); dark-scaled. *Thorax:* Dorsum and pleura with dense covering of overlapping broad spatulate scales, pleural integument brown. Scutum and scutellum covered with metallic greenish gold to gold scales (green in fresh specimens), small bare area at center of prescutellar area; anterior promontory with 3-5 short golden setae on either side of middle, scutellar and supraalar setae well developed, golden; mesopostnotum without scales, with cluster of 5-8 yellowish setae, integument brown. Anteprepronota well developed and closely approximated, each with close-set vertical row of 10-14 golden setae, covered with golden scales with brilliant violet reflections like scales of vertex and occiput; postpronotum and pleura with somewhat transparent metallic silver scales; no scales on lower proepisternum, lower anterior margin of mesokatepisternum, mesomeron, posterior margin of mesepimeron, metapleuron, or metameron. Pleural setae very pale yellow: 2,3 upper proepisternal, 1-3 prespiracular, 1-3 prealar, 2-4 lower mesokatepisternal, and 10-14 upper mesepimeral which project to marginal area of mesopostnotum. *Wing:* Length 3.58-4.20 mm (mean 3.90 mm); entirely dark-scaled, scales with metallic blue reflections; alula with very fine setae on margin distally; upper and lower calypters without setae. *Halter:* Scabellum without scales, integument pale; pedicel and capitellum dark-scaled. *Legs:* Generally dark-scaled with metallic blue reflections; without "paddles." Coxae with silvery scales like those of pleura, postproximal scales absent. Trochanters mainly pale-scaled, with dark scales

distally on dorsal surface. Femora dark-scaled dorsally, pale-scaled (whitish) ventrally; forefemur length 2.38-2.88 mm (mean 2.66 mm), about 1.2 length of proboscis; midfemur longer than forefemur, length 2.50-2.95 mm (mean 2.73 mm); hindfemur shorter than both forefemur and midfemur, length 1.85-2.20 mm (mean 2.01 mm). Fore- and midtibiae entirely dark-scaled; hindtibia narrowly pale-scaled ventrally, essentially same length as hindfemur. Fore- and hindtarsi entirely dark-scaled, midtarsus with white scales on ventral surface of tarsomeres 3 and 4, distally on 2 and sometimes proximally on 5; hindtarsomere 1 longer than either hindfemur or -tibia, length 2.13-2.55 mm (mean 2.39 mm). Ungues dark. *Abdomen:* Terga mainly dark-scaled with metallic blue reflections; sterna and lateral margins of terga pale-scaled (dirty white to slightly yellow), lateral pale scaling of terga slightly produced toward midline, particularly on terga IV and V; anterior margin of tergum I lined with pale setae (no scales on this area) but otherwise with scaling like other terga. *Genitalia* (Fig. 1G-K): Tergum VIII longest in middle, posterior margin slightly convex, all but narrow anterior area covered with scales, posterior margin lined with setae, longest setae in most posterior row, scales mixed with setae. Sternum VIII shortest in middle, posterior margin distinctly concave, rather broad posterior area covered with setae, setae shorter, denser and extending further basad in middle, scales borne anterior to setae but absent from rather broad area along anterior margin. Tergum IX, insula, postgenital lobe, and cerci densely spiculate; tergum IX narrow, very slightly emarginate in middle of posterior margin, with 2,3(2) setae on either side of midline; insula longer than broad, slightly narrowed and rounded distally, with slight depression along midline and 8 tiny setae in irregular row on either side; postgenital lobe flattened in dorsal-ventral plane, longer than cerci, slightly narrowed distally and emarginate at tip, distal 0.5 of dorsal surface with row of 4,5(4) short setae on either side of midline, distal 0.5 of ventral surface completely covered with setae; cercus borne obliquely in relation to sagittal plane of body, appearing 2-segmented in dorsal view but segments weakly demarcated, distal segment larger, flattened and concavo-convex, inner surface concave, both inner and outer surfaces setose on distal 0.5.

Male. Smaller than female, otherwise differing as follows. *Head:* Eyes contiguous between frons and vertex. Occiput without transverse row of semierect scales posteriorly. Proboscis pale-scaled on proximal 0.7 of ventral surface, distinctly white-scaled 0.3-0.7 from base. *Legs:* Entirely dark-scaled, midtarsus without white scales on tarsomeres 2-4. *Abdomen:* Lateral pale scaling of terga not produced toward midline. *Genitalia* (Fig. 1A-F): Tergum and sternum IX fused laterally, forming a complete ring of sclerotization; tergum IX lobes widely separated by narrow bridge, each with 8-11(9) flattened setae in double row. Gonocoxite elongate, somewhat spindle-shaped, broadest in middle and tapering toward each end;

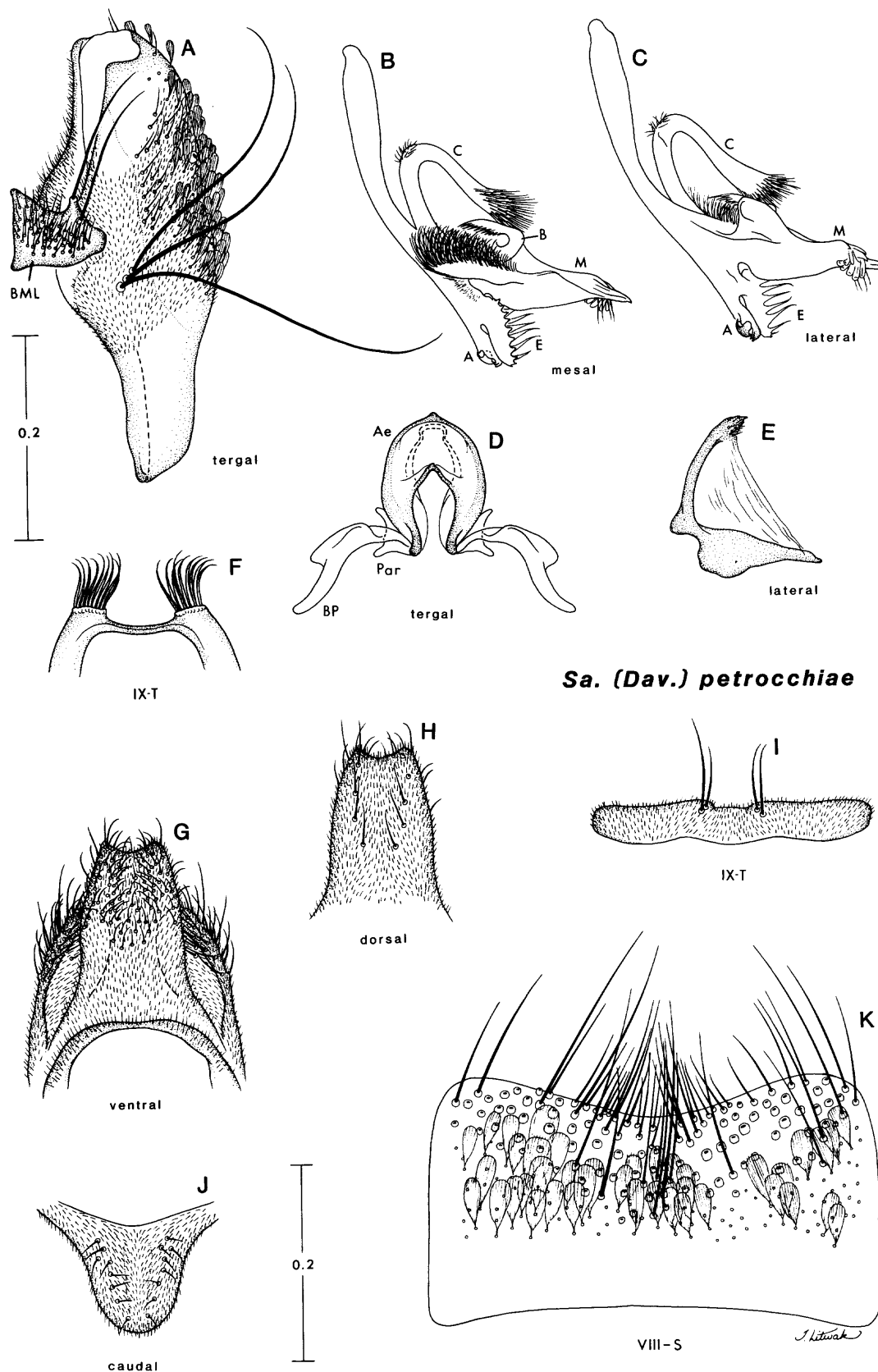


Fig. 1. *Sabethes (Davismyia) petrocchia*. A-F, Male genitalia, aspects as indicated (A, gonocoxite; B,C, gonostylus; D, aedeagus (with parameres and basal pieces attached); E, proctiger; F, tergum IX). G-K, Female genitalia, aspects as indicated (G, postgenital lobe and cerci; H, postgenital lobe; I, tergum IX; J, insula; K, sternum VIII). Scales in mm.

tergolateral margin between 3 long tergomesal setae (= tergal triad of Belkin et al. 1970) and gonostylus with 4 or 5 rows of short setae, distal 0.6 of lateral and sternal surfaces covered with small spatulate scales, sternomesal surface from level of basal mesal lobe to apex with short setae, mesal surface produced in middle at level of basal mesal lobe; basal mesal lobe roughly triangular in shape, covered with short needlelike setae and bearing 2 large setae at caudolateral margin, more sternal of 2 large setae borne on thickened curved armlike process (not evident in figure). Gonostylus about 0.8 length of gonocoxite; stem narrow and slightly bent sternad, about same length as head; head as figured, with 5 lobes developed: lobe M relatively large and sternal in position, apex with membranous projecting ridge on mesal side and curved row of short digiform setae beside row of several fine setae on lateral side, mesal surface with an elongate proximally-directed process near base, sternal margin of this process with a dense covering of rather long hairlike spicules; lobe B a small coiled process arising from mesal side at proximal end of lobe M, distally flattened and pectunculate; lobe C a long flexible recurved arm with a small patch of very short hairlike spicules on elbow and a brushlike collection of rather long hairlike spicules at apex; lobe E elongate with sternal margin bearing a notched ridge on mesal side and a parallel row of flattened flexible acuminate processes on lateral side; lobe A arising at base of lobe E and projecting tergolaterad of it, with a single short stout anchor-shaped seta borne on tergolateral margin before apex. Aedeagus broad, width about 0.75 length, widest point near middle; with submedian tergal arms joined at midline to form a narrow median tergal bridge; apical tergal arms fused and forming an apical tergal bridge with a small median tubercle; median sternal plate small and rather membranous. Proctiger (in lateral view) with triangular basal sclerotization (tergum X) attached at right angle to base of paraproct; paraproct with apex slightly enlarged, bearing several ill-defined teeth and 3-6 short cercal setae.

Larva (Fig. 2). Character and positions of setae as figured; numbers of branches in Table 1. **Head:** Wider than long; length about 0.8 mm; width about 0.9-1.0 mm; moderately and evenly tanned. **Maxilla** (Fig. 3C,D) with distinctive shape and very long cylindrical, mesally curved, apical process with blunt tip; maxillary brush represented by an extremely minute seta (only alveolus shown in figure) located dorsolaterally about 0.25 above base of apical process. **Mandible** as figured (Fig. 3E). **Dorsomentum** with 5 or 6 primary teeth on either side of prominent median tooth, primary teeth progressively longer laterally, most lateral tooth nearly as long as median tooth. Anterior margin of labiogula with fine teeth on either side; hypostomal suture complete, nearly straight and essentially parallel with longitudinal axis of head; occipital foramen with dorsolateral slitlike extension on either side, margin heavily tanned; collar absent. Seta 1-C stout, slightly

curved to straight in dorsal view; 4-6, 13, 15-C single, simple; 4-C on line slightly laterad of 1-C; 9-C inserted on line drawn about halfway between bases of seta 10 and most anterior margin of slit of occipital foramen; 15-C long, extending just beyond anterior margin of head, inserted conspicuously cephalad of 14-C near anterior margin of labiogula. **Antenna:** Short, cylindrical, length about 0.22 mm. Seta 1-A single, about 0.2 from apex. **Thorax:** Integument hyaline, smooth. Setae 5-7-P on common basal plate; 10-P rather short, about 0.6 length of 9-P, with 6-9 aciculate branches. Seta 7-M anterior to 5, 6-M, small and rather inconspicuous, single to triple, more often single; 8-M well developed, nearly as long as 7-P, with 3-6 aciculate branches. Seta 8-T borne laterally between bases of 7-T and metapleural setal group; 13-T about 0.75 length of thorax, with 4-8 branches. **Abdomen:** Integument hyaline, smooth. Seta 1-I mesad of seta 2, 1-II-VII laterad of seta 2, 1-VII unmodified; 10-I far laterad of seta 13; 7-II, III in line with or mesad of seta 9; 4-III, IV mesad of seta 1, between this seta and seta 2; all setae of segment VII borne on dorsal and lateral surfaces. **Segment VIII:** Comb with 16-22 scales in uneven single or partially double curved row, individual scales short and spinelike with minute inconspicuous spicules at sides near base. Seta 4-VIII well caudal to setae 3 and 5, single to triple. **Siphon:** Index 5.2-6.9 (width measured at midlength); short, widest at base, slightly tapering distally; lightly tanned and unadorned. Pecten comprised of midventral row of approximately 40 close-set filamentous spicules beginning well above base and ending well before apex of siphon, length of spicules about same as diameter of siphon at midlength. Seta 1-S borne laterally about 0.4 from base of siphon, single or double, usually single, length about twice diameter of siphon at point of attachment; 1a, 2a-S each represented by only one seta, 1a-S single or double, about 0.1 from apex of siphon, length nearly twice diameter of siphon at point of attachment; 2a-S double or triple, located slightly farther from apex of siphon than 1a-S, length less than diameter of siphon at point of attachment; 2-S laterally compressed, slightly sinuate, pointed and about as long as width of apex of siphon. **Segment X:** Saddle small, length about 0.2 mm, borne on distal 0.6 of dorsal surface, not extending to lateral midline; siphon/saddle index 4.4-5.2. Setae 1, 3, 4-X all very long, length about twice length of siphon; 1, 4-X single, 1-X borne on caudolateral corner of saddle, 4-X without basal support plate; 3-X single or double, borne on small basal support plate with seta 2; 2-X with 3-5 branches of different length, longest branch about 0.7 length of seta 3. Anal papillae subequal in length, sausage-shaped, about as long as siphon.

Pupa (Fig. 3A,B). Character and positions of setae as figured; numbers of branches in Table 2. **Cephalothorax:** Lightly tanned, scutum slightly darker. Seta 1-CT long, double, sigmoid; 5-CT about 0.6 length of 1-CT, only slightly longer than 7-CT, double or triple; 10-12-CT each

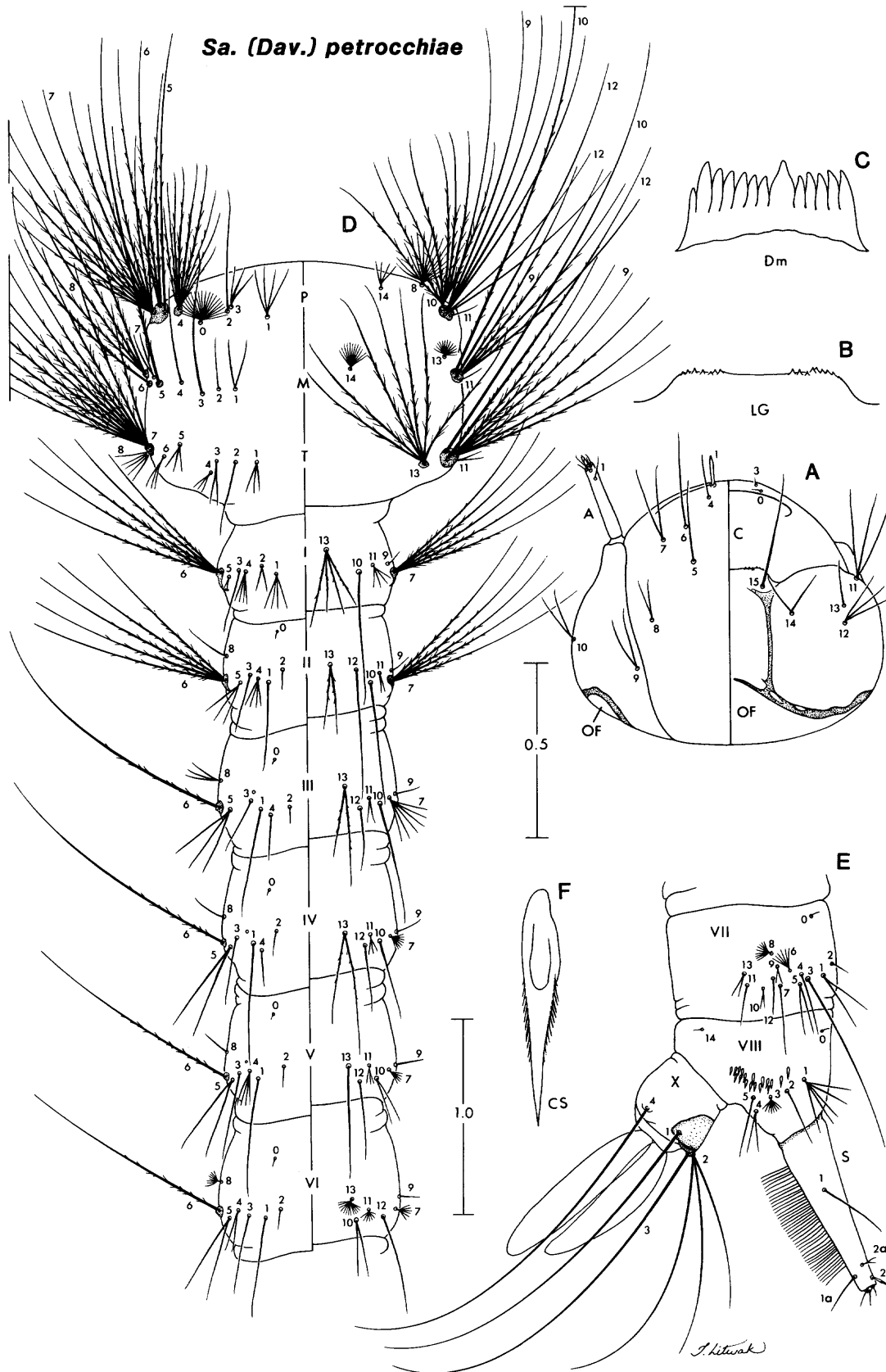


Fig. 2. *Sabethes (Davismyia) petrocchia*, fourth-instar larva. A, Head (dorsal and ventral aspects of left side). B, Anterior margin of labioguila. C, Dorsosentum. D, Thorax and abdominal segments I-VI (dorsal and ventral aspects of left side). E, Abdominal segments VII-X (left side). F, Comb scale. Scales in mm.

Table 1. Number of branches for fourth-instar larval setae of *Sabethes (Davismyia) petrocchia* (three specimens).

Seta no.	Head	P	Thorax		Abdominal segments		
	C		M	T	I	II	III
0	1	12-21	-	-	-	1	1
1	1	3,4(4)	2,3(2)	2,3	3-5(4)	1	1
2	-	1	1	1,2(1)	2,3(2)	1,2(1)	1,2(1)
3	1	2-4(3)	1	2,3(2)	1	1	1
4	1	6-12(11)	1	2,3	3-5(4)	4,5(4)	1
5	1	1	1	2-4(2)	2,3(2)	3	2-4(3)
6	1	3-5(3)	1	1-3(2,3)	4,5(5)	3-6(4,5)	1
7	2,3(2)	9-15	1-3(1)	6-15	5-7(5)	4,5(5)	5-9(6)
8	1,2(2)	8-14(14)	3-6(3,4)	5,6(5)	-	1	2,3
9	2	4-7(5)	3-6(4)	6-8(6)	1	1	1
10	2,3(2)	6-9	1	1	1	1,2	1,2(1)
11	2,3(3)	1	1	1,2(2)	3-5(3,4)	1,2	2-5(2)
12	2,3(2)	1-4(1,2)	1	1	-	1	1
13	1	-	9-13(12)	4-8(4,5)	2-5(3,4)	1,2(2)	2
14	1-3(2)	1-4(3)	8-13(12)	-	-	-	-
15	1	-	-	-	-	-	-

Seta no.	Abdominal segments					
	IV	V	VI	VII	VIII	X
0	1	1	1	1	1	-
1	1,2(2)	1,2(1)	1,2(2)	1-4(3)	5-7(5)	1
2	1	1	1	1	1	3-5(3,4)
3	1	1	1	1	6,8(8)	1,2
4	1	4-6(4)	1,2(2)	1	1-3(2)	1
5	2,3(2)	2,3	2,3(2)	2,3(2)	1,2(1)	-
6	1,2(2)	1	1	4-7(5,6)	-	-
7	6-9(7)	5-8(5)	3-9(5)	1	-	-
8	1-3(1,2)	1-3(2)	7-9(8)	9-13(10)	1-S	1,2(1)
9	1	1	1	1,2(2)	1a-S	1,2(1)
10	1	2,3(2)	1,2(2)	1	2a-S	2,3(2)
11	2,3(3)	3-5(3)	6-10	2,3(2)	-	-
12	1	1	1,3(1)	2-4(2)	-	-
13	2	1,2(2)	13-16(13))	1,2(1)	-	-
14	-	-	-	-	1	-
15	-	-	-	-	-	-

progressively longer in numerical order, 10,11-CT closer together than 11,12-CT. *Trumpet*: Moderately and evenly tanned; short, rather stout, cylindrical, index 2.9-3.1 (width measured at midlength). *Abdomen*: Lightly to moderately tanned, anterior margins of both terga and sterna darker; length about 3.7-3.8 mm. Seta 1-II,IV-VII mesad of seta 3, 1-III in line with or laterad of seta 3, usually laterad; 5-III long, same length as 5-IV, about 1.5 length of following tergum, 5-V,VI longer, about twice length of following

tergum, all single; 6-II single, slightly anterior to setae 7 and 9, significantly longer than seta 7, almost as long as 5-III, 6-VII present and mesad of seta 9; 3-IV far forward of seta 1, 3-V-VII only slightly anterior to seta 1; 8-VI,VII ventral and developed normally. *Genital lobe*: Lightly tanned; length about 0.6 mm in male. *Paddle*: Length 0.67-0.71 mm, width about 0.44 mm, index 1.5-1.6; minutely spiculate at tip.

Taxonomy. The original description of *petrocchia* is

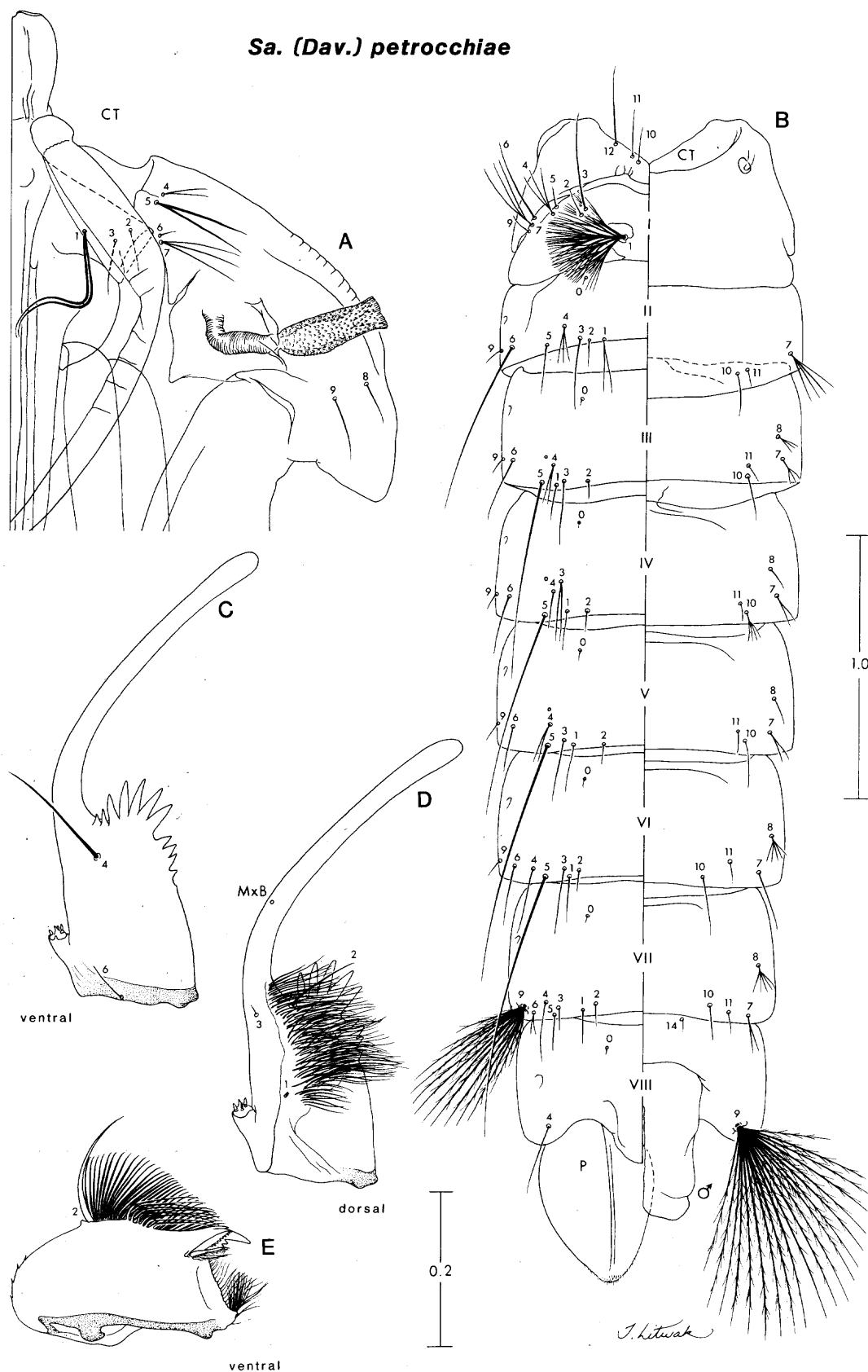


Fig. 3. *Sabethes (Davismyia) petrocchiae*. A,B, Pupa (A, dorsolateral aspect of cephalothorax, left side); B, dorsal and ventral aspects of left side of metathorax and abdomen). C-E, Larval mouthparts, aspects as indicated (C,D, maxilla; E, mandible). Scales in mm.

Table 2. Number of branches for pupal setae of *Sabethes (Davismyia) petrocchiai* (two specimens).

Seta no.	Cephalothorax	Abdominal segments			
	CT	I	II	III	IV
0	-	-	1	1	1
1	2	ca. 70	2	1	1,2(1)
2	1	1	1	1	1
3	1,2(1)	1	1	1	2,3
4	1,2	3	1	1,2	1,2(1)
5	2,3	1	1	1	1
6	1	1	1	1	1
7	1-3(2)	2,3	2,4	1-3(3)	2
8	1	-	-	2-4(3)	1
9	1	1	1	1	1
10	1	-	1	1	1,4(1)
11	1	1	1	1	1
12	1,2(1)	-	-	-	-
13	-	-	-	-	-
14	-	-	-	-	-

Seta no.	Abdominal segments					Paddle P
	V	VI	VII	VIII	IX	
0	1	1	1	1	-	-
1	1	1	1	-	-	-
2	1	1	1	-	-	-
3	1	1	1	-	-	-
4	2,3(2)	1	1	1	-	-
5	1	1	1	-	-	-
6	1	1	1,2(2)	-	-	-
7	2,3(2)	1	1,2	-	-	-
8	1,2(2)	3,5(3)	3,5	-	-	-
9	1	1	13	18-21	-	-
10	1	1	1	-	-	-
11	1	1	1	-	-	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	1	-	-

based on five females collected from three localities in northwestern Argentina. The authors (Shannon and del Ponte 1928) gave the following information about these specimens but did not indicate where they were deposited: "Localidad del tipo: Tucuman (Raco, 13.2.27, Shannon y Del Ponte). Tambien se la ha encontrado en la Quebrada de Lules, Tuc., (3.2.27) y en Zapla, Jujuy (10.4.27, Shannon y Del Ponte)." According to Stone and Knight (1957) the "holotype" is in the United States National Museum, but

this specimen bears a label inscribed with "Vipos, Tuc./ 3.V.27/R.C. Shannon" which clearly indicates that it is not one of the specimens from the original type series. For this reason we hereby invalidate the holotype status of this specimen. None of the specimens listed by Shannon and del Ponte are located in the USNM.

Lane (1953) indicated that the "type" of *petrocchiai* was deposited in the Instituto Bacteriologico del Departamento Nacional de Higiene (superseded by the Instituto Nacional

de Microbiologia) in Buenos Aires, but the specimen is not there. One of us (ELP), with the assistance of Diego J. Carpintero (curator) and Richard C. Wilkerson, recently examined and verified the presence of several mosquito type specimens in this institution, but *petrocchia* was not one of them. According to J. Pedro Duret (personal communication, July 1990) the "type" was probably destroyed long ago. Since there is only negative evidence for the existence of any type specimens for this species, we consider them to be non-extant.

Although we have no doubt that the species described and illustrated in this study is conspecific with the mosquito which Shannon and del Ponte (1928) described and named as *Miomyia petrocchia*, a primary type specimen is needed to fix the identity of this species. We considered the selection of a neotype specimen from material available to us from Argentina, but none of it was individually reared and is not suitable as type material.

Bionomics. Although *petrocchia* has been collected and observed several times in four countries, there are few published comments on the bionomics of this species. Shannon and del Ponte (1928) collected five females while biting (man?) and speculated on the possible larval habitat by stating (translation ours): "This species along with its allies, very likely accomplishes the habit of breeding in treeholes, especially in this case in which the specimens captured were in a heavily forested region, where only very small bromeliads are found (Raco)." Lane and Causey (1955) described and illustrated the larva and pupa, but did not mention the habitat from which these were collected. Roberts et al. (1984) collected females biting humans during the daytime at canopy level in a double canopy gallery forest in southeastern Bolivia. Except for one female collected by Peyton and Roberts in Bolivia and two females collected by J. P. Duret in Argentina (see below), none of the other specimens examined during this study were accompanied with information on bionomics.

Distribution. *Sabethes petrocchia* is recorded from Paraguay and neighboring areas of Bolivia, northern Argentina, and southern Brazil (see literature summary and material examined).

Material examined. 52 specimens (33♀, 5♂, 3♀ genitalia, 5♂ genitalia, 3 larval exuviae, 2 pupal exuviae, and 1 fourth-instar larva) including 2 individual rearings. ARGENTINA: *Misiones*, Alba Posse, 4-III-51, Duret, 1♀ (A.U.72 [= Alto Uruguay]); *El Soberbio*, 14-III-51, Duret, 1♀ (A.U.35); *Obera*, Arroyo Bonito, 2-III-66, 1♀ (6005); *Obera*, Barra Bonita, 6-III-66, 1♀ (6004) [NMNH]; *Puerto Londero*, 23 Nov 47, M. Viana, 3♀ [BA]. *Salta*, Las Lagunas, Camp Simulidae, 2 Apr 52, 1♀ (03620-14) [MLP]. *Santa Fe*, El Espejo, a.m. II-62, 1♀ [BA]. *Tucuman*, Vipos, 3 May 1927, R.C. Shannon, 1♀ [NMNH]. BOLIVIA: *Santa Cruz*, Rincon Del Tigre, 3-4 km SW of Mission, 18 May 1982, E.L. Peyton & D.R. Roberts, 1♀ [NMNH]. BRAZIL: *Goiaz*, Anapolis, Nov 1937, 1♀ (16517); Dec 1937, 1♀ (16663); Jan 1938, R.C. Shannon Collection, 2♀;

Feb 1938, R.C. Shannon Collection, 6♀, 2♀ genitalia [FMSP]. *Mato Grosso*, Cuiaba, Feb 1935, 1♀ (3304); Apr 1935, 2♀ (3744, 3745), 1♀ genitalia (3745) [FMSP]. *Minas Gerais*, [Passos?], 1LePe♂, 1♂ genitalia (P202(1) [9378?]) = invalid allotype of Lane and Causey 1955), 1LePe♂, 1♂ genitalia (P199(1)) [FMSP]. *Sao Paulo*, Coqueiros, IX-54, Duret 2♀ (5957, 5959); 11-55, Duret, 1♀ (5958); 9-XI-55, Duret, 1♀ (5956) [NMNH]. PARAGUAY: *Alto Parana*, Hernandarias, 12-VII-51, Duret 1♀ [NMNH]. *San Pedro*, U.d. Rosario, 9-XI-55, Duret, 1♀ [NMNH]. *Locality unknown*, 2♂, 2♂ genitalia (P.400-1, P.562-2) [NMNH]; 1♂, 1♂ genitalia (P.562-1) [BM]; 1Le (Lab. no. P64-2), 1L (Lab. no. P223-1) [FMSP].

ACKNOWLEDGMENTS

We are grateful to Prof. Oswaldo Paulo Forattini, Faculdade de Saude Publica, Universidade de Sao Paulo, and Bruce Townsend, Natural History Museum, London, for the loan of specimens; Bruce A. Harrison, Ronald A. Ward, and Richard C. Wilkerson, Walter Reed Army Institute of Research (WRAIR) for commenting on the manuscript; Taina Litwak (WRAIR) for preparing the illustrations; and James Pecor (WRAIR) for technical assistance.

REFERENCES CITED

- Belkin, J.N. 1968. Mosquito studies (Diptera, Culicidae) IX. The type specimens of New World mosquitoes in European museums. *Contrib. Am. Entomol. Inst. (Ann Arbor)* 3(4):1-69.
- Belkin, J.N. 1971. Mosquito types in East Germany. *Mosq. Syst. News Lett.* 3:31.
- Belkin, J.N., S.J. Heinemann and W.A. Page. 1970. Mosquito studies (Diptera: Culicidae) XXI. The Culicidae of Jamaica. *Contrib. Am. Entomol. Inst. (Ann Arbor)* 6(1):1-458.
- Belkin, J.N., R.X. Schick and S.J. Heinemann. 1968. Mosquito studies (Diptera, Culicidae) XI. Mosquitoes originally described from Argentina, Bolivia, Chile, Paraguay, Peru, and Uruguay. *Contrib. Am. Entomol. Inst. (Ann Arbor)* 4(1):9-29.
- da Costa Lima, A. 1930. Sobre especies do genero *Miomyia*, subgenero *Miomyia* (2ª. nota) (Diptera: Culicidae). *Mem. Inst. Oswaldo Cruz Rio de J.* 24:187-194, 3 pl.
- de Rodaniche, E. and P. Galindo. 1957. Isolation of Ilheus virus from *Sabethes chloropterus* captured in Guatemala in 1956. *Am. J. Trop. Med. Hyg.* 6:686-687.
- de Rodaniche, E., P. Galindo and C.M. Johnson. 1957. Isolation of yellow fever virus from *Haemagogus lucifer*, *H. equinus*, *H. spegazzinii* Falco [sic], *Sabethes chloropterus* and *Anopheles neivai* captured in Panama in the fall of 1956. *Am. J. Trop. Med. Hyg.* 6:681-685.
- de Rodaniche, E., P. Galindo and C.M. Johnson. 1959.

- Further studies on the experimental transmission of yellow fever by *Sabethes chloropterus*. *Am. J. Trop. Med. Hyg.* 8:190-194.
- del Ponte, E. 1939. Identificación de "Sabethini" (Dip. Culicidae) por medio de tarjetas perforadas. *Physis* (Rev. Soc. Argent. Ciencias Nat.) 17:535-541.
- del Ponte, E. and N. Cerqueira. 1938. Alguns sabethíneos do Brasil (Diptera, Culicidae). *Rev. Entomol. (Rio de J.)* 8:225-237.
- Duret, J.P. 1950. Lista de los mosquitos de la republica Argentina. *Rev. Soc. Entomol. Arg.* 14:297-318.
- Dyar, H.G. 1928. The mosquitoes of the Americas. Carnegie Inst. Wash. Publ. No. 387:616 pp.
- Edwards, F.W. 1932. Genera Insectorum. Diptera. Fam. Culicidae. Fascicle 194. Desmet-Verteneul, Bruxelles. 258 pp., 5 pl.
- Fauran, P. and F.X. Pajot. 1974. *Wyeomyia ininicola* n. sp. (Diptera, Culicidae) [sic], nouveau moustique de la Guyane française. *Cah. O.R.S.T.O.M. Ser. Entomol. Med. Parasitol.* 12:145-148.
- Galindo, P., E. de Rodaniche and H. Trapido. 1956. Experimental transmission of yellow fever by Central American species of *Haemagogus* and *Sabethes chloropterus*. *Am. J. Trop. Med. Hyg.* 5:1022-1031.
- Galindo, P., E. de Rodaniche and C.M. Johnson. 1959. St. Louis encephalitis in Panama I. Isolation of the virus from forest mosquitoes and human blood. *Am. J. Trop. Med. Hyg.* 8:557-560.
- Harbach, R.E. and K.L. Knight. 1980. Taxonomists' glossary of mosquito anatomy. Plexus Publishing, Inc., Marlton, NJ. 415 pp.
- Harbach, R.E. and K.L. Knight. 1982. Corrections and additions to *Taxonomists' glossary of mosquito anatomy*. *Mosq. Syst.* (1981) 13:201-217.
- Harbach, R.E. and E.L. Peyton. 1990. A new subgenus in *Wyeomyia* (Diptera: Culicidae), with the reclassification and redescription of the type species, *Sabethes fernandezyepezi*. *Mosq. Syst.* 22:15-23.
- Lane, J. 1936. II. Notas sobre mosquitos de São Paulo. *Bol. Inst. Hyg. Sao Paulo* 60:1-15, 5 pl.
- Lane, J. 1937. Notas sobre investigações entomológicas em localidades onde houve febre amarela sylvestre em São Paulo. II Parte: A região do Sorocabana. *Arch. Hyg. Saude Publica* 3:123-130.
- Lane, J. 1939. Catálogo mosquitos neotrópicos. *Bol. Biol. Ser. Monogr.* No. 1. 218 pp.
- Lane, J. 1953. Neotropical Culicidae. Vols. 1 and 2. University of Sao Paulo, Sao Paulo, Brazil. 1,112 pp.
- Lane, J. and O.R. Causey. 1955. Additional data on Sabethini (Diptera, Culicidae). *Proc. Entomol. Soc. Wash.* 57:11-17.
- Lane, J. and N.L. Cerqueira. 1942. Os sabetíneos da América (Diptera: Culicidae). *Arq. Zool. Estado Sao Paulo* 3:473-849.
- Lutz, A. 1905. Novas especies de mosquitos do Brasil. *Imprensa Med.* 13(16):311-314.
- Martini, E. 1931a. Ueber einige südamerikanische Culicidae. *Rev. Entomol. (Rio de J.)* 1:199-219.
- Martini, E. 1931b. Die Ausbeute der deutschen Chaco-Expedition 1925/26. -- Diptera. XXV. Culicidae. *Konowia* 10:116-120.
- Mattingly, P.F. 1955. Mosquitoes (Diptera: Culicidae) from the Tropical Institute of Hamburg. *Proc. R. Entomol. Soc. Lond. B Taxon.* 24:27-33.
- Peyton, E.L., D.R. Roberts, F.P. Pinheiro, R. Vargas and F. Balderama. 1983. Mosquito collections from a remote unstudied area of southeastern Bolivia. *Mosq. Syst.* 15:61-89.
- Prosen, A.F., R.U. Carcavallo and A. Martínez. 1963. *Culicidae* [sic] de Bolivia (Diptera). *An. Inst. Med. Reg.* 6:59-124, 4 pl.
- Roberts, D.R., E.L. Peyton, F.P. Pinheiro, F. Balderama and R. Vargas. 1984. Associations of arbovirus vectors with gallery forests and domestic environments in southeastern Bolivia. *PAHO Bull.* 18:337-350.
- Shannon, R.C. 1930. List of species of argentine Culicidae. Sexta Reunion de la Sociedad Argentina de Patologia Regional del Norte. pp. 494-500.
- Shannon, R.C. and E. del Ponte. 1928. Los culicidos en la Argentina. *Rev. Inst. Bacteriol. B. Aires* (1927) 5:29-140.
- Stone, A. and K.L. Knight. 1957. Type specimens of mosquitoes in the United States National Museum, V: The Sabethini (Diptera, Culicidae). *J. Wash. Acad. Sci.* 47:117-126.